Stability analysis of cylindrical and elliptical metal nanowires

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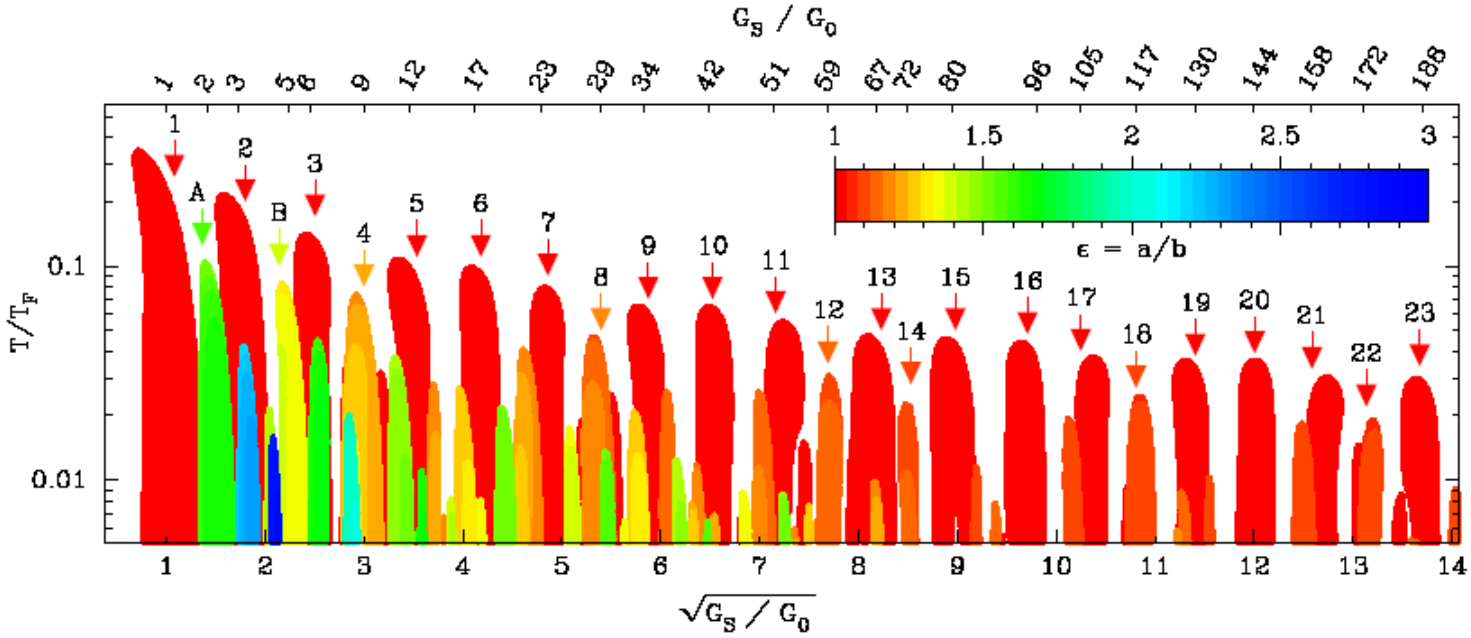
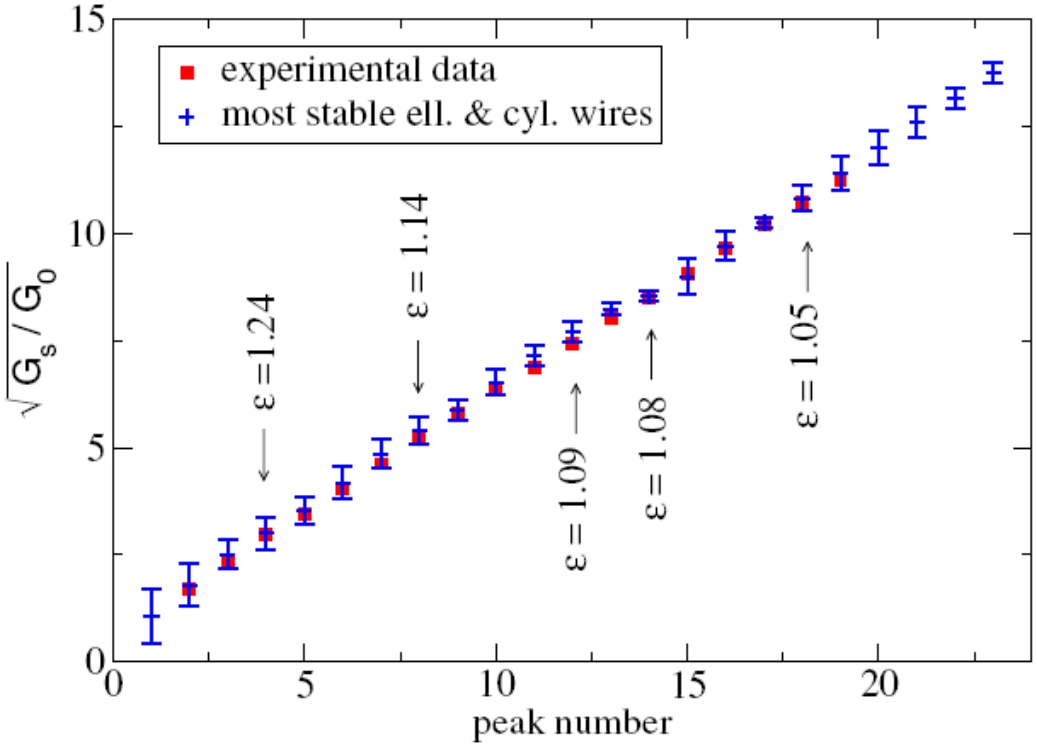
Linear stability analysis for monovalent metals using *nanoscale free-electron model*.
Magic cylinders with $G/G_0 = 1, 3, 6, 12, 17, 23, \ldots$ predicted to be extremely stable, where $G_0 = 2e^2/h$ is the conductance quantum.
Stable wires with $G/G_0 = 2, 5, 9, 29, \ldots$ predicted to have elliptic cross sections.



D. F. Urban, J. Bürki, C.-H. Zhang, CAS & H. Grabert, Phys. Rev. Lett. **93**, 186403 (2004)

Comparison of experimental data for sodium with predicted most stable sodium nanowires



Exp: A. I. Yanson, I. K. Yanson & J. M. van Ruitenbeek, Nature **400**, 144 (1999)

Theory: D. F. Urban, J. Bürki, C.-H. Zhang, CAS & H. Grabert, Phys. Rev. Lett. **93**, 186403 (2004)

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Broader impact
Metal interconnects predicted to be stable all the way down to atomic scale!

Education
Two graduate students (Chang-hua Zhang and Daniel Urban) and one postdoc (Jérôme Bürki) contributed to this work. Zhang received his Ph.D. in 2004, and is currently a postdoc at Indiana University.

Outreach
Organized Public Lecture Series on Nanoscience and Nanotechnology at the University of Arizona (2001-2004)

International collaboration
This work was carried out in collaboration with Hermann Grabert and D. Urban of Albert-Ludwigs-Universität, Freiburg, Germany.